

Abstract

Magnetoresistive (MR) sensors are disclosed having mechanisms for reducing edge effects such as Barkhausen noise. The sensors include a pinned layer and a free layer with an exchange coupling layer adjoining the free layer, and a ferromagnetic layer having a fixed magnetic moment adjoining the exchange coupling layer. The exchange coupling layer and ferromagnetic layer form a synthetic antiferromagnetic structure with part of the free layer, providing bias that reduces magnetic instabilities at edges of the free layer. Such synthetic antiferromagnetic structures can provide a stronger bias than conventional antiferromagnetic layers, as well as a more exactly defined track width than conventional hard magnetic bias layers. The synthetic antiferromagnetic structures can also provide protection for the free layer during processing, in contrast with the trimming of conventional antiferromagnetic layers that exposes if not removes part of the free layer.

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